Potable Water

But when it comes to
slaughter you will do your work
on water, an' you'll lick the
bloomin' boots of 'im that's got
it.

Rudyard Kipling

Gunga Din

Essential to Life

The human body uses water for a number of purposes. It carries nutrients within your body, and carries out the toxins. For Soldiers and other physically active people, water has a remarkable ability to cool the body through perspiration.

In fact over 60 percent of you body weight is water, and dehydration can quickly prove serious if not fatal. You must replace the loss of water daily.

Necessary for personal hygiene

Cleanliness is not just a matter of comfort. It is a medical necessity. Showers and clean laundry help prevent infections and other skin problems. Clean clothing is the best defense against the spread of deadly typhus through lice.

We wash our eating utensils to avoid intestinal disease.

Medical units require large amounts of clean water because of all of their laundry requirements.

Or a Killer????

Humans need water to remain healthy.

Yet contaminated water can be a dangerous menace to public health. All types of deadly or sickening microbes can live in water. Typhoid fever amd cholera have long been deadly health problems in regions lacking water treatment. More mundane problems might include simple diarrhea or non-fatal illnesses. Larvae for parasitic worms can also exist in water.

Before the 20th century far more Soldiers died from disease than in battle, and the water supply was a major cause of camp diseases.

Even when not contaminated by bacteria, water might contain dirt, algae, or other substances that make it unhealthy or else ruin the taste.

Beginnings of Water Treatment

Historically humans have recognized that clear flowing water is better than stagnant or putrid water. Yet they did not understand why nor did they understand how seemingly clear water might still be contaminated with bacteria.

In the late 19th century, scientists discovered bacteria and other microscopic organisms and the link between many of these microbes and infectious diseases. These discoveries became part of a major revolution in public health for both Europe and America. Municipal water supplies became an obvious means of improving the public health.

When injected into the water supply, chlorine will kill microbes. Beginning in 1895, Germany and Britain experimented with chlorination. Soon chlorination became a standard means of controlling water-borne disease.

Basics of Water Treatment

(Before ROWPU's)

The basic steps for treating a water supply developed in the early 20th century and remain standard practice for most civil water supplies today. The same essential process was used by the military until the development of the ROWPU (Reverse Osmosis Water Purification Unit).

First the system looks for the best water supply possible for intake, with the least obvious contamination. Water is then placed in large containers where chemicals such as alum, or soda ash are added. These chemicals will cling to little bits of sediment until they form clumps that will fall to the bottom of the container.

At that point the top water is skimmed off and sent through a filter system to remove the smaller particles. Chlorine is added to kill the microbes either as a gas injected into the water or through a chemical process.

The system works well enough for most fresh water supplies, but it cannot remove salts from the water.

In the Army

Between the Spanish-American War in 1898 and American entry into World War I in 1917 the Army had its own medical revolution.

Even before the Spanish-American War, the Army medical community began research on infectious diseases, especially those that afflicted Soldiers. People such as George Sternberg and Walter Reed established their reputations as doctors, Soldiers, and scientists for their pioneering research.

The Spanish American War demonstrated the appalling state of preventive medicine in the Army. The overwhelming proportion of casualties came from infectious diseases. Even with the still limited medical knowledge of the time, many of these diseases should have been preventable.

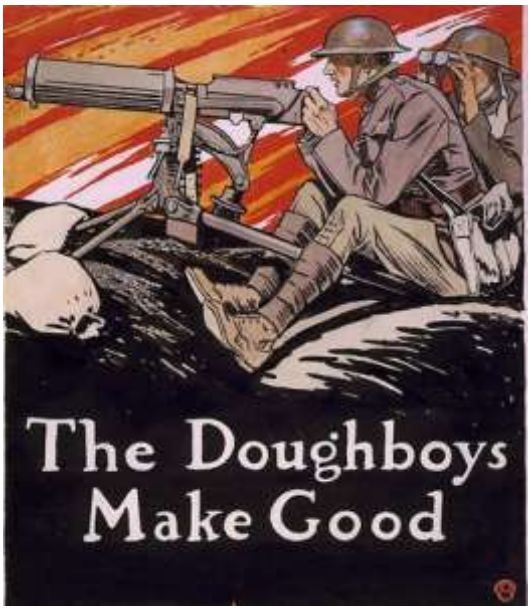
In the early 20th century the Army pushed hard to improve its own preventive medicine. Clean water was a part of this revolution.

World War I

As the United States entered World War I, the Corps of Engineers had responsibility for providing clean, healthy water.

Near the camps, hospitals, or other semi-permanent facilities, the Engineers constructed water purification operations that resembled the civilian community (flocking, filtering, chlorination). Near the combat areas the engineers improvised truck-mounted water purification equipment.

In contrast to other World War I equipment, the water purification was American designed.



Even with the means to purify water, Soldiers frequently used any source available. Some Soldiers were said to believe that water with frogs was probably free from poison gas.

Expedient Methods

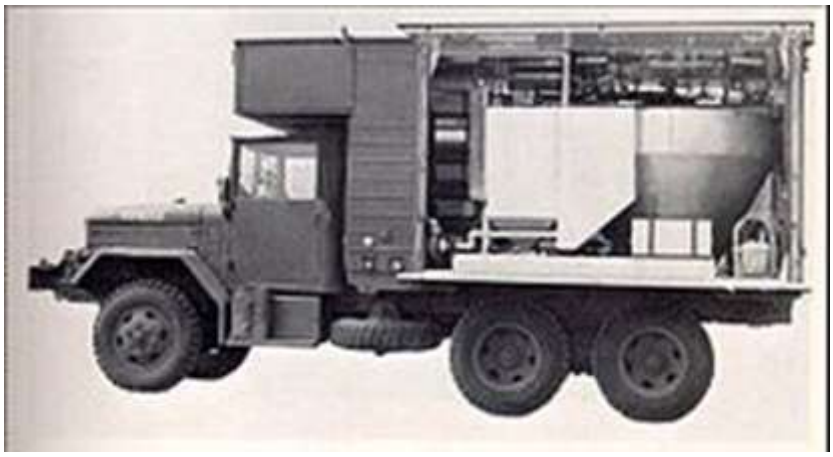
Even before the Engineers began developing their water purification methods, the Medical Department developed some simpler, expedient methods to kill bacteria by adding chlorine.

About 1910 Major W. L. Lyster had the idea of placing water into a linen bag and then adding calcium hypochlorite to kill microbes in the water. The Lyster bag (or lister bag) has remained a standard method of producing potable water when other means are not available. It can also be used as a holding point.

When all other means are not available, a user can add tablets of chlorine or iodine to a canteen in order to remove bacteria.

Of course neither method does anything to remove solid matter.

Erdlator



At the outbreak of World War II the Engineering Research Development Laboratory designed a complete truck mounted water purification system that derived its name from their acronym (ERDL). This became the workhorse for water purification from World War II well past the Vietnam era.

The system used the same steps of flocking, filtering, and chlorination.

Despite its usefulness it had limitations. It could not be used for salt water, or to remove other chemicals. It required a supply of chemicals for operation.

WWII, Korea, Vietnam

From World War II through the post-Vietnam era, the water purification process changed little. Engineer water purification units set up operations near a stream or other acceptable water point. If the stream was too shallow, a few explosives could easily create a pond. Water was processed through the Erdlator.

In exceptional cases a well drilling unit might be needed to reach ground water.

Soldiers soon came to appreciate the value of purified water which prevented intestinal diseases.

Transfer to Quartermaster Corps

In 1981 responsibility for water purification transferred from the Corps of Engineers to the Quartermaster Corps, where it has remained since that time.

Reverse Osmosis

The science for Reverse Osmosis developed in the civilian community independently of Army requirements.

Osmosis is a process where water passes through a semi permeable membrane. This is how plants absorb water through the membrane systems in their roots.

Reverse Osmosis is using some form of physical pressure to force contaminated water through a membrane that will not allow impurities to pass through. Often this means removing salt from sea water, but it can mean removing any impurities from the water.

The system works by placing the untreated water on one side of the membrane and forcing it through. The water can pass through, but not the larger molecules, even the salt.

Technological breakthroughs for the Reverse Osmosis process came in the 1970s as engineers developed a commercially produced membrane that was capable of containing the impurities, but strong enough to withstand the pressure of its use.

Reverse Osmosis Water Purification Unit

(ROWPU)

The Army quickly grasped the potential usefulness of reverse osmosis for tactical use. It could be used for salty or brackish water; especially in the Middle East. Unlike the Erdlator it did not require a resupply of specialized chemicals.

The first requirements statements developed in 1974, while water purification was still an Engineer function. The first military Reverse Osmosis Water Purification Units entered the Army inventory in 1979 and continued to enter the Army throughout the 1980s, even as responsibility transferred to the Quartermaster Corps.

Operations Desert Shield/Desert Storm

The big test for Reverse Osmosis water treatment came in 1990 and 1991 when the United States came to the defense of Kuwait against Iraq. Each person required about 20 gallons of water per day.

By this time the ROWPU was a proven technology, but without combat experience to identify all of the potential problems. The Army waived some testing for the 3,000 gallon-per-hour (gph) ROWPU, and obtained other units.

The Army had not yet fielded an adequate repair parts package, even for the 600 gph model; and this affected readiness.

Despite the developmental issues, the ROWPU had clearly proven itself to be the only means of conducting military operations in the deserts of the Middle East. It is difficult to imagine how the United States and its allies could have liberated Kuwait without the ROWPU.

14th QM Detachment

(Water Purification)

The greatest proportion of casualties of any unit in Operation Desert Storm came to a water purification unit just days before the truce.

The 14th Quartermaster Detachment is an Army Reserve unit from Pennsylvania. They were activated during the fighting and arrived in theater on February 19, 1991. On February 24 an Iraqi SCUD missile hit their barracks.

Of the detachment's 69 Soldiers, 13 were killed and 43 wounded, creating an 81 percent casualty rate. Soldiers from other units were also killed or wounded in those barracks, but the 14th QM Detachment suffered the greatest percentage of casualties.

The truce came three days after the attack.

Iraq and Afghanistan

At the beginning of the 21st century the United States once again engaged in extensive military operations in the Middle East. This time in Iraq and Afghanistan.

Although the mountains of Afghanistan can be brutally cold in the winter, summers can be hot and dry. There is little water infrastructure in either of these places.

Once again the ability of the United States to conduct military operations depended upon the ROWPU and water purification.

This time much of the water distribution has occurred through small bottles of drinking water, similar to the public demand within the United States.

The Future

No matter what else may change, Soldiers will always need potable water. It must be free from microbes, harmful chemicals, and ordinary dirt.

We may change the technology for obtaining water. We may change our ways of purifying water. The need for water will remain.